PadhAI: The Convolution Operation

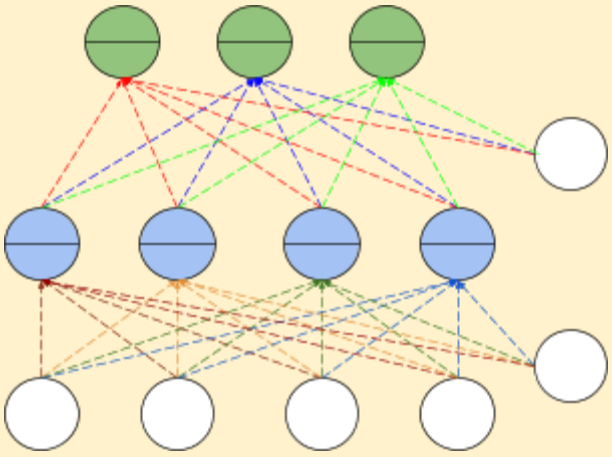
One Fourth Labs

The Convolution Operation

Setting the Context

Making sense of everything we have seen so far

1. So far, all the Neural Networks that we have studied are called fully connected networks



2. **Fully Connected Neural Networks**: Any neuron in a given layer is fully connected to all the neurons in the previous layer
3. Let's look at some of the pros and cons of Fully Connected Neural Networks (DNNs)

Pros	Cons
The Universal Approximation Theorem says that DNNs are power function approximators We can come up with a neural network of output $\hat{f}(x)$ which is very close to the true output $f(x)$	DNNs are prone to overfitting (too many parameters) Even a slight change in the training set could cause the model to arrive at very different weight configurations
Can be trained using backpropagation In PyTorch, backpropagation is automated.	Gradients can vanish due to long chains Vanishing gradient problem could occur in the case of saturated neurons

4. We aimed to mitigate these issues using
   a. Better Optimization Algorithms
   b. Better Activation Functions
   c. Better Initialisation Methods
   d. Better Regularization
5. Can we have DNNs which are complex (many non-linearities) but have fewer parameters and hence less prone to overfitting?